



# QUICK SOLUTION ENABLES SAFE DEPLOYMENT OF C-17 AIRCRAFT TO BOSNIA



## Payoff

The Fuels and Lubrication Division of the Propulsion Directorate, provided a solution to an operational problem that was instrumental in ensuring the safe deployment of C-17 aircraft to Bosnia in December 1995. The Directorate's timely analysis of a problem involving a series of lubricant-related failures of the integrated drive generators on the F117 engine of several C-17 aircraft, enabled the Air Force to deploy the aircraft on schedule to Bosnia in support of the peacekeeping mission.

## Accomplishment

Working under a deadline of less than one week, the Propulsion Directorate provided the C-17 System Program Office (SPO) information on the cause and prevention of potentially catastrophic lubricant related failures of the integrated drive generators (IDGs) on the F117 engines of several C-17 aircraft. From samples provided by the SPO, Directorate scientists determined that the oil was reacting with the magnesium alloy housing of the IDG in the presence of water (probably from high humidity) to form a magnesium carboxylate soap. This soap clogged oil lines and filters, causing lubricant starvation and eventual mechanical system failure within the IDG. The C-17 IDGs were put on a short period (50 hour) oil change schedule and instructions were issued to

maintenance crews to monitor the oil closely for the soapy material.

## **Background**

It has been known for at least 40 years that a detrimental chemical reaction between magnesium and ester oils will take place in the presence of high levels (<1,000 to 2,000 parts per million) of water at typical turbine engine operational temperatures (>300°F). For this reason, the Air Force has strictly controlled or prohibited magnesium containing components from coming in contact with the polyol ester oils, which are used in most turbine engines and turbomachinery world-wide. A few turbomachinery component manufacturers still insist on using magnesium components in oil-wetted systems, despite the knowledge of potentially dire consequences. Fortunately, the level of water in most turbine oil systems does not rise above 1,000 parts per million, under normal circumstances, thereby somewhat alleviating the problem of magnesium-oil reaction. The lower water concentration is typical because most systems are vented to the atmosphere, allowing water to be evaporated out of the system. The current C-17 IDG, however, is essentially a closed system with one valve on the IDG that will occasionally actuate to allow air into the IDG. If humid air enters, moisture is trapped which can lead to the formation of the magnesium soap and eventual failure of the IDG.